

**CEQA PRELIMINARY**  
**HYDROLOGY/ DRAINAGE STUDY**  
**NISSHO RANCH SUBDIVISION**  
**TPM 21057**

County of San Diego

**LOG NO. 07- 02- 005**

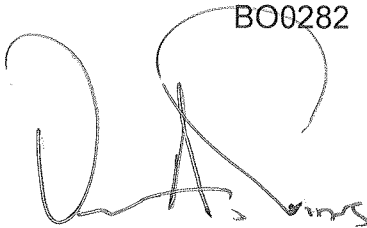
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Dated: July 3, 2007

Prepared By:  
***Snipes-Dye Associates***  
***civil engineers and land surveyors***

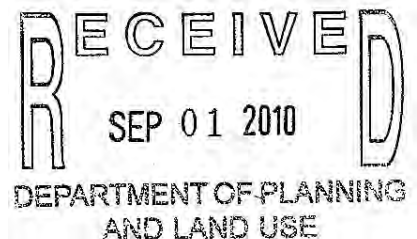
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La Mesa, CA 91942-2910  
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BO0282



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William A. Snipes, R.C.E. 50477



## **Preliminary Hydrology and Hydraulic Calculations For Nissho Ranch**

The project proposes the development of a standard residential subdivision on 31.85 acres of land that is currently under agricultural cultivation. The site is located at the end of Emerald Drive approximately 2500 feet North of North River Road. The project site is situated on top of a hill that slopes to the east and west. The western half of the property consists of slopes ranging between 15-25% and the eastern half consists of slopes ranging between 25-50%.

Current site drainage consists of sheet flow and minor concentrated surface flow from the center of the property east and west to natural drainage swales and conveyed offsite. The remainder of the site consists of minor concentrated surface flow for the center of the property south to Emerald Hills Road and discharged off-site.

Rational method peak discharge calculations have been prepared for the site. Calculations include pre and post-development flows for the 100-year six-hour storm events. Common points of discharge were chosen on-site to provide comparison points for pre and post-development flows. Calculated 100-year, six-hour peak discharge for the pre-development condition is approximately 95.6 cubic feet per second. See attached detailed calculations.

Project development proposes to extend Emerald Hills Road approximately 700 feet for site access to the 5 proposed residential lots. Developed project site drainage for the western half of the site will consist of sheet flow and minor concentrated surface flow conveyed across and around graded pads discharged to Emerald Hills Road conveyed north discharged over rock dissipators into an existing natural drainage swale and conveyed off-site. The eastern side of the property will consist of sheet flow conveyed across graded pads, discharged over rock dissipators collected by natural drainage swales and conveyed off-site. The remainder of the site consists of minor concentrated surface flow discharged to Emerald Hills Road conveyed south and discharged off-site.

The post-developed conditions will decrease the peak discharge by 3.0 cubic feet per second in the 100-year six-hour storm event. The slight decrease in discharge is a result of lengthened flow paths, increased time of concentration, and a reduced slope gradient consistent with grading and development of residential sites.

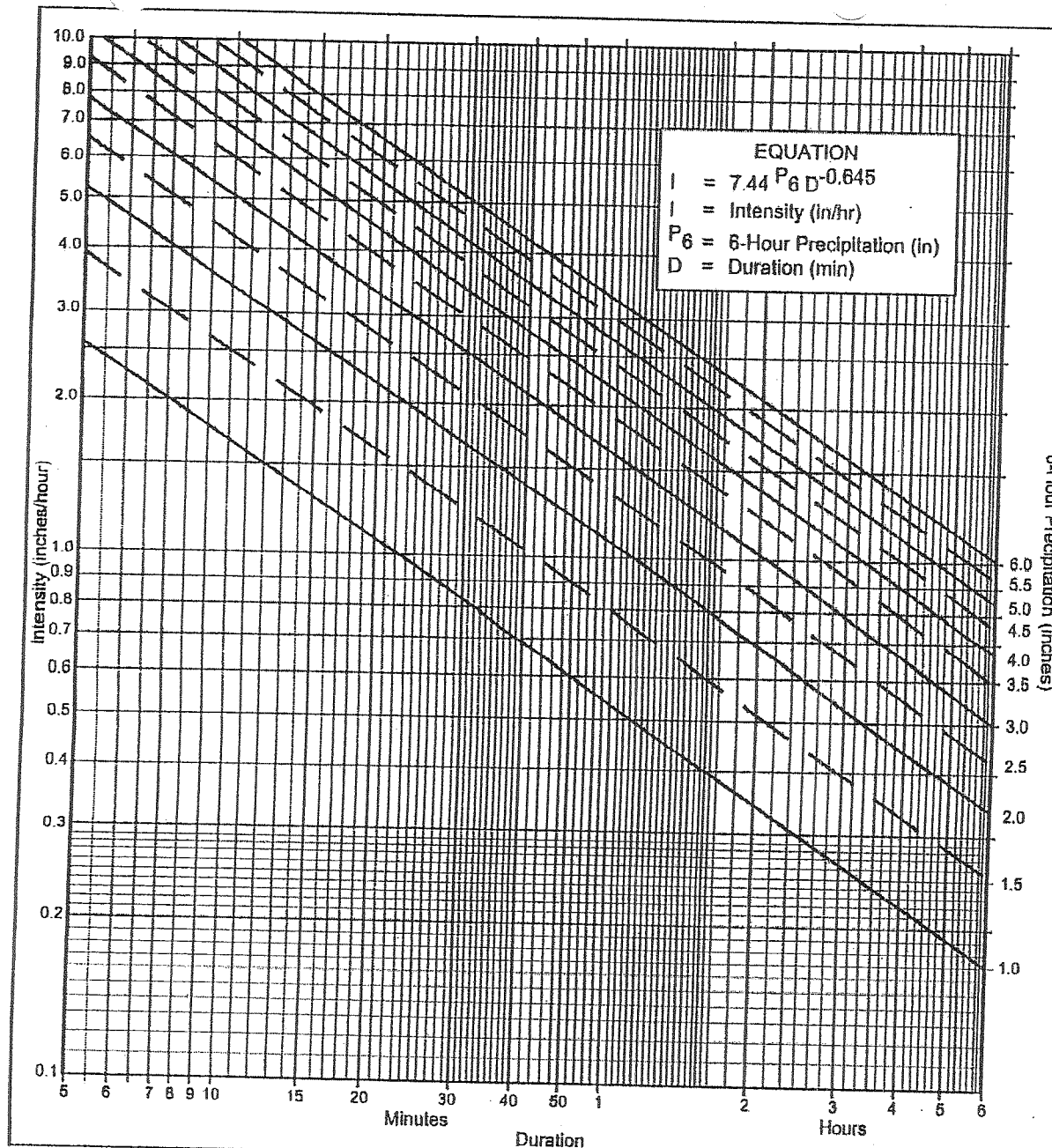
Proposed site development does not divert any existing drainage patterns. The proposed development of home sites will be flood free in the 100 year storm event.

Hydrology and flow calculations were prepared utilizing AES Hydrology software and the current San Diego County Hydrology Manual.

# SUMMARY

## 100-YEAR FREQUENCY

COMPARISON POINT	PRE-DEVELOPMENT			POST-DEVELOPMENT		
	Q (cfs)	T <sub>c</sub> (min.)	Area (ac.)	Q (cfs)	T <sub>c</sub> (min.)	Area (ac.)
Q <sub>A</sub>	22.54	6.66	8.51	17.99	9.85	8.74
Q <sub>B</sub>	12.69	8.63	5.66	14.16	7.00	5.41
Q <sub>C</sub>	4.23	7.13	1.67	4.39	6.88	1.69
Q <sub>D</sub>	19.68	6.80	7.53	19.23	6.80	7.36
Q <sub>E</sub>	15.85	6.59	5.94	16.20	6.65	6.11
Q <sub>F</sub>	20.63	6.50	7.67	20.63	6.50	7.67
TOTAL	95.62		36.98	92.60		36.98



#### Directions for Application:

- (1) From precipitation maps determine 6 hr and 24 hr amounts for the selected frequency. These maps are included in the County Hydrology Manual (10, 50, and 100 yr maps included in the Design and Procedure Manual).
- (2) Adjust 6 hr precipitation (if necessary) so that it is within the range of 45% to 65% of the 24 hr precipitation (not applicable to Desert).
- (3) Plot 6 hr precipitation on the right side of the chart.
- (4) Draw a line through the point parallel to the plotted lines.
- (5) This line is the Intensity-duration curve for the location being analyzed.

#### Application Form:

- (a) Selected frequency 100 year
- (b)  $P_6 = 2.95$  in.,  $P_{24} = 5.30$ ,  $\frac{P_6}{P_{24}} = .56$  %<sup>(2)</sup>
- (c) Adjusted  $P_6^{(2)} =$  \_\_\_\_\_ in.
- (d)  $t_x =$  \_\_\_\_\_ min.
- (e)  $I =$  \_\_\_\_\_ in./hr.

Note: This chart replaces the Intensity-Duration-Frequency curves used since 1965.

P6	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6
Duration											
5	2.63	3.95	5.27	6.59	7.90	9.22	10.54	11.86	13.17	14.49	15.81
7	2.12	3.18	4.24	5.30	6.36	7.42	8.48	9.54	10.60	11.66	12.72
10	1.68	2.53	3.37	4.21	5.05	5.90	6.74	7.58	8.42	9.27	10.11
15	1.30	1.95	2.59	3.24	3.89	4.54	5.19	5.84	6.49	7.13	7.78
20	1.08	1.62	2.15	2.69	3.23	3.77	4.31	4.85	5.39	5.93	6.46
25	0.93	1.40	1.87	2.33	2.80	3.27	3.73	4.20	4.67	5.13	5.60
30	0.83	1.24	1.66	2.07	2.49	2.90	3.32	3.73	4.15	4.56	4.98
40	0.69	1.03	1.38	1.72	2.07	2.41	2.76	3.10	3.45	3.79	4.13
50	0.60	0.90	1.19	1.49	1.79	2.09	2.39	2.69	2.98	3.28	3.58
60	0.53	0.80	1.06	1.33	1.59	1.86	2.12	2.39	2.65	2.92	3.18
90	0.41	0.61	0.82	1.02	1.23	1.43	1.63	1.84	2.04	2.25	2.45
120	0.34	0.51	0.68	0.85	1.02	1.19	1.36	1.53	1.70	1.87	2.04
150	0.29	0.44	0.59	0.73	0.88	1.03	1.18	1.32	1.47	1.62	1.76
180	0.26	0.39	0.52	0.65	0.78	0.91	1.04	1.18	1.31	1.44	1.57
240	0.22	0.33	0.43	0.54	0.65	0.76	0.87	0.98	1.08	1.19	1.30
300	0.19	0.28	0.38	0.47	0.56	0.66	0.75	0.85	0.94	1.03	1.13
360	0.17	0.25	0.33	0.42	0.50	0.58	0.67	0.75	0.84	0.92	1.00

Intensity-Duration Design Chart - Template

FIGURE

3-1

# County of San Diego Hydrology Manual



## Rainfall Isophuvials

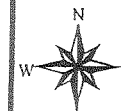
100 Year Rainfall Event - 6 Hours

..... Isophluvial (inches)

$P_6 = 2.95$  inches

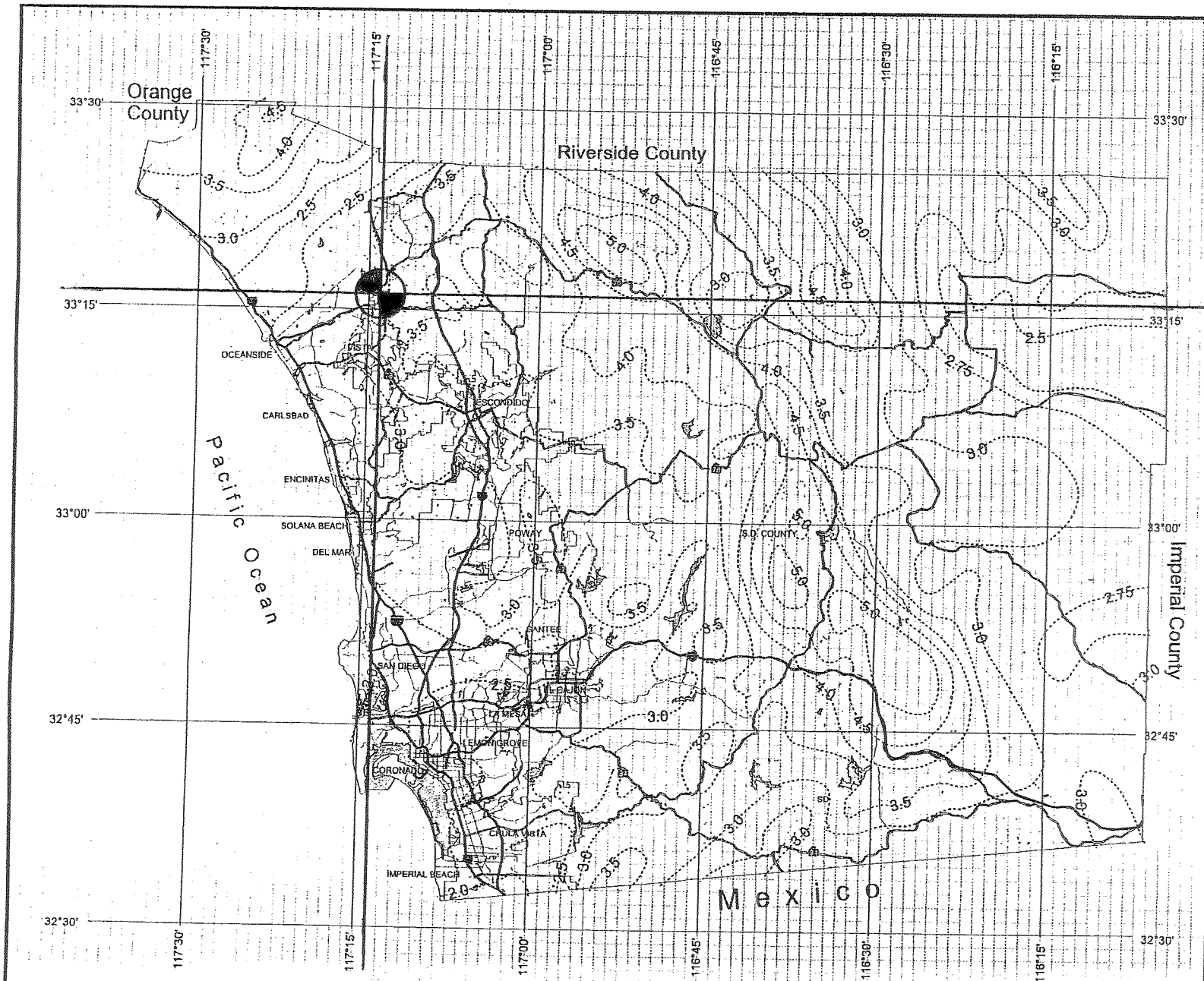
**DPW  
GIS**  
Department of Public Works  
Geographic Information Services

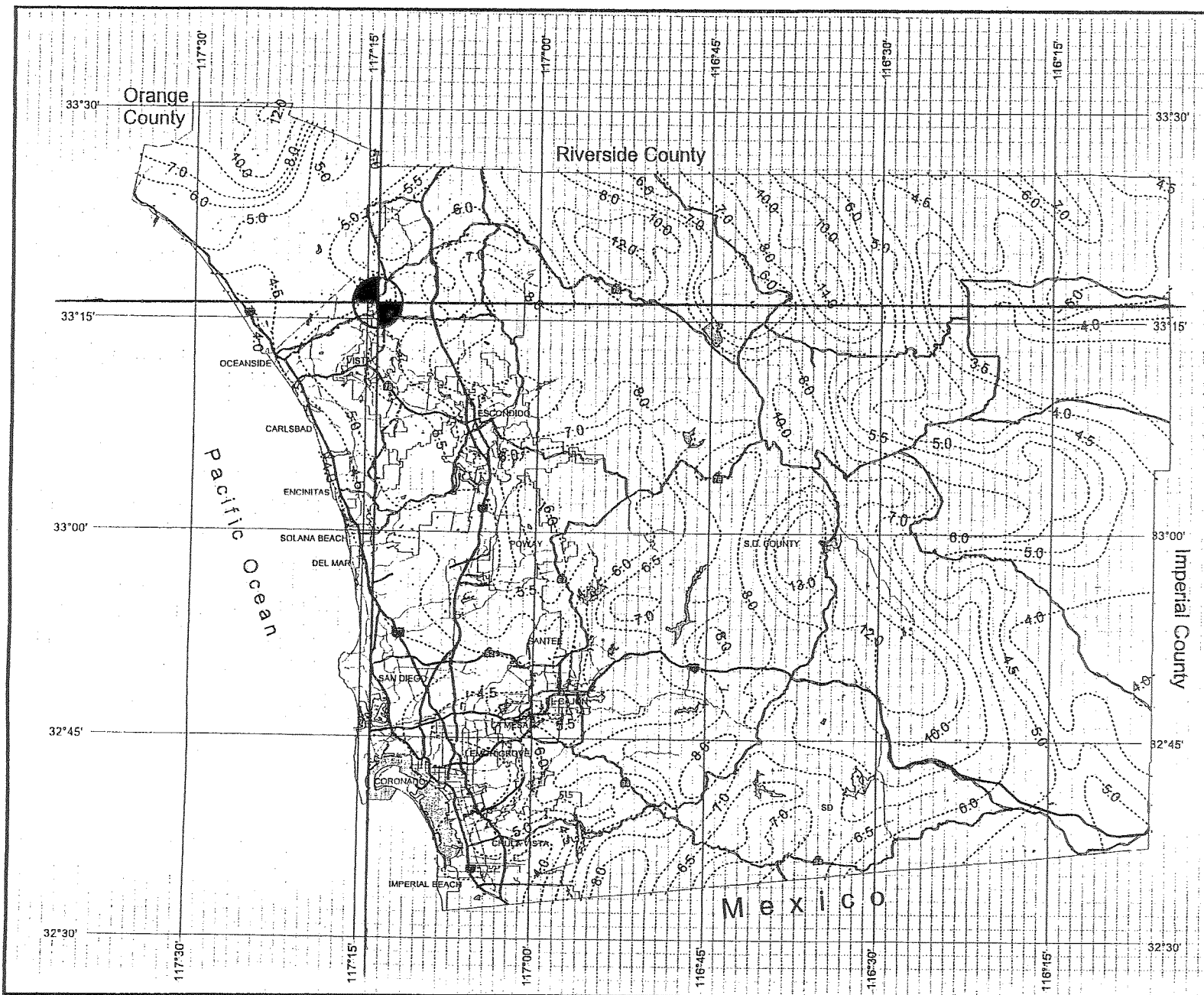
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3 0 3 Miles

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# County of San Diego Hydrology Manual



## Rainfall Isoplethials

### 100 Year Rainfall Event - 24 Hours

----- Isoplethial (inches)

$P_{24} = 5.30$  inches

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**Table 3-1  
RUNOFF COEFFICIENTS FOR URBAN AREAS**

Land Use		Runoff Coefficient "C"				
NRCS Elements	County Elements	% IMPER.	Soil Type			
			A	B	C	D
Undisturbed Natural Terrain (Natural)	Permanent Open Space	0*	0.20	0.25	0.30	0.35
Low Density Residential (LDR)	Residential, 1.0 DU/A or less	10	0.27	0.32	0.36	0.41
Low Density Residential (LDR)	Residential, 2.0 DU/A or less	20	0.34	0.38	0.42	0.46
Low Density Residential (LDR)	Residential, 2.9 DU/A or less	25	0.38	0.41	0.45	0.49
Medium Density Residential (MDR)	Residential, 4.3 DU/A or less	30	0.41	0.45	0.48	0.52
Medium Density Residential (MDR)	Residential, 7.3 DU/A or less	40	0.48	0.51	0.54	0.57
Medium Density Residential (MDR)	Residential, 10.9 DU/A or less	45	0.52	0.54	0.57	0.60
Medium Density Residential (MDR)	Residential, 14.5 DU/A or less	50	0.55	0.58	0.60	0.63
High Density Residential (HDR)	Residential, 24.0 DU/A or less	65	0.66	0.67	0.69	0.71
High Density Residential (HDR)	Residential, 43.0 DU/A or less	80	0.76	0.77	0.78	0.79
Commercial/Industrial (N. Com)	Neighborhood Commercial	80	0.76	0.77	0.78	0.79
Commercial/Industrial (G. Com)	General Commercial	85	0.80	0.80	0.81	0.82
Commercial/Industrial (O.P. Com)	Office Professional/Commercial	90	0.83	0.84	0.84	0.85
Commercial/Industrial (Limited I.)	Limited Industrial	90	0.83	0.84	0.84	0.85
Commercial/Industrial (General I.)	General Industrial	95	0.87	0.87	0.87	0.87

\*The values associated with 0% impervious may be used for direct calculation of the runoff coefficient as described in Section 3.1.2 (representing the pervious runoff coefficient,  $C_p$ , for the soil type), or for areas that will remain undisturbed in perpetuity. Justification must be given that the area will remain natural forever (e.g., the area is located in Cleveland National Forest).

DU/A = dwelling units per acre

NRCS = National Resources Conservation Service

\*\*\*\*\*

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE  
Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT  
2003,1985,1981 HYDROLOGY MANUAL  
(c) Copyright 1982-2005 Advanced Engineering Software (aes)  
Ver. 2.0 Release Date: 06/01/2005 License ID 1305

Analysis prepared by: CSW

\*\*\*\*\* DESCRIPTION OF STUDY \*\*\*\*\*  
NISSHO RANCH  
PRE-DEVELOPMENT HYDROLOGY STUDY  
100-YEAR FREQUENCY  
\*\*\*\*\*

FILE NAME: BO02PR1.DAT  
TIME/DATE OF STUDY: 10:52 06/26/2007

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USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:  
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2003 SAN DIEGO MANUAL CRITERIA

USER SPECIFIED STORM EVENT(YEAR) = 100.00  
6-HOUR DURATION PRECIPITATION (INCHES) = 2.950  
SPECIFIED MINIMUM PIPE SIZE(INCH) = 3.00  
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95  
SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD  
NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS

\*USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL\*

NO.	HALF- WIDTH (FT)	CROWN TO CROSSFALL (FT)	STREET-CROSSFALL: IN- / OUT- / PARK- SIDE / SIDE / WAY	CURB HEIGHT (FT)	GUTTER-GEOMETRIES: WIDTH (FT)	LIP (FT)	HIKE (FT)	MANNING FACTOR (n)
1	30.0	20.0	0.018/0.018/0.020	0.67	2.00	0.0313	0.167	0.0150

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

1. Relative Flow-Depth = 0.00 FEET  
as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
2. (Depth)\*(Velocity) Constraint = 6.0 (FT\*FT/S)

\*SIZE PIPE WITH A FLOW CAPACITY GREATER THAN  
OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.\*



# BASIN A

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*****
FLOW PROCESS FROM NODE      1.00 TO NODE      2.00 IS CODE =  21
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>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
=====
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```
RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .4100
SOIL CLASSIFICATION IS "D"
S.C.S. CURVE NUMBER (AMC II) =  82
INITIAL SUBAREA FLOW-LENGTH(FEET) =  100.00
UPSTREAM ELEVATION(FEET) =      375.00
DOWNSTREAM ELEVATION(FEET) =      365.00
ELEVATION DIFFERENCE(FEET) =      10.00
SUBAREA OVERLAND TIME OF FLOW(MIN.) =      5.765
100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  7.090
SUBAREA RUNOFF(CFS) =          0.29
TOTAL AREA(ACRES) =          0.10  TOTAL RUNOFF(CFS) =          0.29
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*****
FLOW PROCESS FROM NODE      2.00 TO NODE      3.00 IS CODE =  91
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```
>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
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```
UPSTREAM NODE ELEVATION(FEET) =      365.00
DOWNSTREAM NODE ELEVATION(FEET) =      258.00
CHANNEL LENGTH THRU SUBAREA(FEET) =  700.00
"V" GUTTER WIDTH(FEET) =  5.00  GUTTER HIKE(FEET) =  0.500
PAVEMENT LIP(FEET) =  0.400  MANNING'S N = .0300
PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.02000
MAXIMUM DEPTH(FEET) =  1.00
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) =  6.459
RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .4100
SOIL CLASSIFICATION IS "D"
S.C.S. CURVE NUMBER (AMC II) =  82
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      11.43
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =  13.01
AVERAGE FLOW DEPTH(FEET) =  0.90  FLOOD WIDTH(FEET) =  5.00
"V" GUTTER FLOW TRAVEL TIME(MIN.) =  0.90  Tc(MIN.) =  6.66
SUBAREA AREA(ACRES) =  8.41  SUBAREA RUNOFF(CFS) =  22.27
AREA-AVERAGE RUNOFF COEFFICIENT =  0.410
TOTAL AREA(ACRES) =  8.51  PEAK FLOW RATE(CFS) =      22.54
END OF SUBAREA "V" GUTTER HYDRAULICS:
DEPTH(FEET) =  0.90  FLOOD WIDTH(FEET) =  5.00
FLOW VELOCITY(FEET/SEC.) =  13.01  DEPTH*VELOCITY(FT*FT/SEC) =  11.71
LONGEST FLOWPATH FROM NODE      1.00 TO NODE      3.00 =  800.00 FEET.
```

```
*****
FLOW PROCESS FROM NODE      3.00 TO NODE      3.00 IS CODE =  13
-----
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>>>>CLEAR THE MAIN-STREAM MEMORY<<<<<
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BASIN A

=====

END OF STUDY SUMMARY:

TOTAL AREA (ACRES)       =       8.51   TC (MIN.) =       6.66

PEAK FLOW RATE (CFS)     =       22.54

=====

END OF RATIONAL METHOD ANALYSIS

# BASIN B

\*\*\*\*\*

FLOW PROCESS FROM NODE 4.00 TO NODE 5.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<

=====

RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .4100  
 SOIL CLASSIFICATION IS "D"  
 S.C.S. CURVE NUMBER (AMC II) = 82  
 INITIAL SUBAREA FLOW-LENGTH(FEET) = 100.00  
 UPSTREAM ELEVATION(FEET) = 380.00  
 DOWNSTREAM ELEVATION(FEET) = 373.50  
 ELEVATION DIFFERENCE(FEET) = 6.50  
 SUBAREA OVERLAND TIME OF FLOW(MIN.) = 6.655  
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 6.463  
 SUBAREA RUNOFF(CFS) = 0.24  
 TOTAL AREA(ACRES) = 0.09 TOTAL RUNOFF(CFS) = 0.24

\*\*\*\*\*

FLOW PROCESS FROM NODE 5.00 TO NODE 6.00 IS CODE = 91

>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<

=====

UPSTREAM NODE ELEVATION(FEET) = 373.50  
 DOWNSTREAM NODE ELEVATION(FEET) = 235.00  
 CHANNEL LENGTH THRU SUBAREA(FEET) = 900.00  
 "V" GUTTER WIDTH(FEET) = 5.00 GUTTER HIKE(FEET) = 0.500  
 PAVEMENT LIP(FEET) = 0.400 MANNING'S N = .0300  
 PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.02000  
 MAXIMUM DEPTH(FEET) = 1.50  
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 5.467  
 RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .4100  
 SOIL CLASSIFICATION IS "D"  
 S.C.S. CURVE NUMBER (AMC II) = 82  
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 6.48  
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 7.61  
 AVERAGE FLOW DEPTH(FEET) = 0.50 FLOOD WIDTH(FEET) = 5.00  
 "V" GUTTER FLOW TRAVEL TIME(MIN.) = 1.97 Tc(MIN.) = 8.63  
 SUBAREA AREA(ACRES) = 5.57 SUBAREA RUNOFF(CFS) = 12.49  
 AREA-AVERAGE RUNOFF COEFFICIENT = 0.410  
 TOTAL AREA(ACRES) = 5.66 PEAK FLOW RATE(CFS) = 12.69  
 END OF SUBAREA "V" GUTTER HYDRAULICS:  
 DEPTH(FEET) = 0.90 FLOOD WIDTH(FEET) = 5.00  
 FLOW VELOCITY(FEET/SEC.) = 13.06 DEPTH\*VELOCITY(FT\*FT/SEC) = 11.75  
 LONGEST FLOWPATH FROM NODE 4.00 TO NODE 6.00 = 1000.00 FEET.

\*\*\*\*\*

FLOW PROCESS FROM NODE 6.00 TO NODE 6.00 IS CODE = 13

>>>>CLEAR THE MAIN-STREAM MEMORY<<<<<

=====

BASIN B

```
=====
END OF STUDY SUMMARY:
TOTAL AREA (ACRES)      =      5.66  TC (MIN.) =      8.63
PEAK FLOW RATE (CFS)    =      12.69
=====
END OF RATIONAL METHOD ANALYSIS
```

# BASIN C

\*\*\*\*\*

FLOW PROCESS FROM NODE 7.00 TO NODE 8.00 IS CODE = 21

-----  
>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<

=====

RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .4100

SOIL CLASSIFICATION IS "D"

S.C.S. CURVE NUMBER (AMC II) = 82

INITIAL SUBAREA FLOW-LENGTH(FEET) = 100.00

UPSTREAM ELEVATION(FEET) = 380.00

DOWNSTREAM ELEVATION(FEET) = 372.00

ELEVATION DIFFERENCE(FEET) = 8.00

SUBAREA OVERLAND TIME OF FLOW(MIN.) = 6.210

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 6.758

SUBAREA RUNOFF(CFS) = 0.25

TOTAL AREA(ACRES) = 0.09 TOTAL RUNOFF(CFS) = 0.25

\*\*\*\*\*

FLOW PROCESS FROM NODE 8.00 TO NODE 9.00 IS CODE = 91

-----  
>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<

=====

UPSTREAM NODE ELEVATION(FEET) = 372.00

DOWNSTREAM NODE ELEVATION(FEET) = 349.00

CHANNEL LENGTH THRU SUBAREA(FEET) = 140.00

"V" GUTTER WIDTH(FEET) = 5.00 GUTTER HIKE(FEET) = 0.500

PAVEMENT LIP(FEET) = 0.400 MANNING'S N = .0300

PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.02000

MAXIMUM DEPTH(FEET) = 1.00

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 6.558

RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .4100

SOIL CLASSIFICATION IS "D"

S.C.S. CURVE NUMBER (AMC II) = 82

TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 0.56

TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 7.86

AVERAGE FLOW DEPTH(FEET) = 0.50 FLOOD WIDTH(FEET) = 5.00

"V" GUTTER FLOW TRAVEL TIME(MIN.) = 0.30 Tc(MIN.) = 6.51

SUBAREA AREA(ACRES) = 0.23 SUBAREA RUNOFF(CFS) = 0.62

AREA-AVERAGE RUNOFF COEFFICIENT = 0.410

TOTAL AREA(ACRES) = 0.32 PEAK FLOW RATE(CFS) = 0.86

END OF SUBAREA "V" GUTTER HYDRAULICS:

DEPTH(FEET) = 0.50 FLOOD WIDTH(FEET) = 5.00

FLOW VELOCITY(FEET/SEC.) = 7.86 DEPTH\*VELOCITY(FT\*FT/SEC) = 3.93

LONGEST FLOWPATH FROM NODE 7.00 TO NODE 9.00 = 240.00 FEET.

\*\*\*\*\*  
FLOW PROCESS FROM NODE 9.00 TO NODE 10.00 IS CODE = 61  
-----

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<  
>>>>(STANDARD CURB SECTION USED)<<<<<  
=====

UPSTREAM ELEVATION(FEET) = 349.00 DOWNSTREAM ELEVATION(FEET) = 310.00  
STREET LENGTH(FEET) = 240.00 CURB HEIGHT(INCHES) = 6.0  
STREET HALFWIDTH(FEET) = 10.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 2.00  
INSIDE STREET CROSSFALL(DECIMAL) = 0.020  
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2  
STREET PARKWAY CROSSFALL(DECIMAL) = 0.020  
Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150  
Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200

\*\*TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 2.57  
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:  
STREET FLOW DEPTH(FEET) = 0.18  
HALFSTREET FLOOD WIDTH(FEET) = 2.85  
AVERAGE FLOW VELOCITY(FEET/SEC.) = 6.46  
PRODUCT OF DEPTH&VELOCITY(FT\*FT/SEC.) = 1.18  
STREET FLOW TRAVEL TIME(MIN.) = 0.62 Tc(MIN.) = 7.13  
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 6.184  
RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .4100  
SOIL CLASSIFICATION IS "D"  
S.C.S. CURVE NUMBER (AMC II) = 82  
AREA-AVERAGE RUNOFF COEFFICIENT = 0.410  
SUBAREA AREA(ACRES) = 1.35 SUBAREA RUNOFF(CFS) = 3.42  
TOTAL AREA(ACRES) = 1.67 PEAK FLOW RATE(CFS) = 4.23

END OF SUBAREA STREET FLOW HYDRAULICS:  
DEPTH(FEET) = 0.22 HALFSTREET FLOOD WIDTH(FEET) = 4.47  
FLOW VELOCITY(FEET/SEC.) = 6.66 DEPTH\*VELOCITY(FT\*FT/SEC.) = 1.44  
LONGEST FLOWPATH FROM NODE 7.00 TO NODE 10.00 = 480.00 FEET.

\*\*\*\*\*  
FLOW PROCESS FROM NODE 10.00 TO NODE 10.00 IS CODE = 13  
-----

>>>>CLEAR THE MAIN-STREAM MEMORY<<<<<  
=====

## BASIN C

### END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 1.67 TC(MIN.) = 7.13  
PEAK FLOW RATE(CFS) = 4.23  
=====

END OF RATIONAL METHOD ANALYSIS

# BASIN D

```
*****
FLOW PROCESS FROM NODE      11.00 TO NODE      12.00 IS CODE = 21
-----
```

```
>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
=====
```

```
RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .4100
SOIL CLASSIFICATION IS "D"
S.C.S. CURVE NUMBER (AMC II) = 82
INITIAL SUBAREA FLOW-LENGTH(FEET) = 100.00
UPSTREAM ELEVATION(FEET) = 375.00
DOWNSTREAM ELEVATION(FEET) = 360.00
ELEVATION DIFFERENCE(FEET) = 15.00
SUBAREA OVERLAND TIME OF FLOW(MIN.) = 5.765
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 7.090
SUBAREA RUNOFF(CFS) = 0.32
TOTAL AREA(ACRES) = 0.11 TOTAL RUNOFF(CFS) = 0.32
```

```
*****
FLOW PROCESS FROM NODE      12.00 TO NODE      13.00 IS CODE = 91
-----
```

```
>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
=====
```

```
UPSTREAM NODE ELEVATION(FEET) = 360.00
DOWNSTREAM NODE ELEVATION(FEET) = 156.50
CHANNEL LENGTH THRU SUBAREA(FEET) = 810.00
"V" GUTTER WIDTH(FEET) = 5.00 GUTTER HIKE(FEET) = 0.800
PAVEMENT LIP(FEET) = 0.400 MANNING'S N = .0300
PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.02000
MAXIMUM DEPTH(FEET) = 5.00
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 6.374
RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .4100
SOIL CLASSIFICATION IS "D"
S.C.S. CURVE NUMBER (AMC II) = 82
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 10.02
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 13.05
AVERAGE FLOW DEPTH(FEET) = 0.80 FLOOD WIDTH(FEET) = 5.00
"V" GUTTER FLOW TRAVEL TIME(MIN.) = 1.03 Tc(MIN.) = 6.80
SUBAREA AREA(ACRES) = 7.42 SUBAREA RUNOFF(CFS) = 19.39
AREA-AVERAGE RUNOFF COEFFICIENT = 0.410
TOTAL AREA(ACRES) = 7.53 PEAK FLOW RATE(CFS) = 19.68
END OF SUBAREA "V" GUTTER HYDRAULICS:
DEPTH(FEET) = 0.80 FLOOD WIDTH(FEET) = 5.00
FLOW VELOCITY(FEET/SEC.) = 13.05 DEPTH*VELOCITY(FT*FT/SEC) = 10.44
LONGEST FLOWPATH FROM NODE      11.00 TO NODE      13.00 = 910.00 FEET.
```

```
*****
FLOW PROCESS FROM NODE      13.00 TO NODE      13.00 IS CODE = 13
-----
```

```
>>>>CLEAR THE MAIN-STREAM MEMORY<<<<<
=====
```

BASIN D

=====

END OF STUDY SUMMARY:

TOTAL AREA (ACRES)        =        7.53    TC (MIN.) =        6.80

PEAK FLOW RATE (CFS)     =        19.68

=====

END OF RATIONAL METHOD ANALYSIS



# BASIN E

```
*****
FLOW PROCESS FROM NODE      14.00 TO NODE      15.00 IS CODE =  21
-----
```

```
>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
=====
```

```
RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .4100
SOIL CLASSIFICATION IS "D"
S.C.S. CURVE NUMBER (AMC II) =  82
INITIAL SUBAREA FLOW-LENGTH (FEET) =  100.00
UPSTREAM ELEVATION (FEET) =  342.00
DOWNSTREAM ELEVATION (FEET) =  331.00
ELEVATION DIFFERENCE (FEET) =  11.00
SUBAREA OVERLAND TIME OF FLOW (MIN.) =  5.765
100 YEAR RAINFALL INTENSITY (INCH/HOUR) =  7.090
SUBAREA RUNOFF (CFS) =  0.26
TOTAL AREA (ACRES) =  0.09  TOTAL RUNOFF (CFS) =  0.26
```

```
*****
FLOW PROCESS FROM NODE      15.00 TO NODE      16.00 IS CODE =  91
-----
```

```
>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
=====
```

```
UPSTREAM NODE ELEVATION (FEET) =  331.00
DOWNSTREAM NODE ELEVATION (FEET) =  156.00
CHANNEL LENGTH THRU SUBAREA (FEET) =  660.00
"V" GUTTER WIDTH (FEET) =  5.00  GUTTER HIKE (FEET) =  0.800
PAVEMENT LIP (FEET) =  0.400  MANNING'S N = .0300
PAVEMENT CROSSFALL (DECIMAL NOTATION) = 0.02000
MAXIMUM DEPTH (FEET) =  5.00
100 YEAR RAINFALL INTENSITY (INCH/HOUR) =  6.507
RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .4100
SOIL CLASSIFICATION IS "D"
S.C.S. CURVE NUMBER (AMC II) =  82
TRAVEL TIME COMPUTED USING ESTIMATED FLOW (CFS) =  8.07
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY (FEET/SEC.) =  13.40
AVERAGE FLOW DEPTH (FEET) =  0.80  FLOOD WIDTH (FEET) =  5.00
"V" GUTTER FLOW TRAVEL TIME (MIN.) =  0.82  Tc (MIN.) =  6.59
SUBAREA AREA (ACRES) =  5.85  SUBAREA RUNOFF (CFS) =  15.61
AREA-AVERAGE RUNOFF COEFFICIENT =  0.410
TOTAL AREA (ACRES) =  5.94  PEAK FLOW RATE (CFS) =  15.85
END OF SUBAREA "V" GUTTER HYDRAULICS:
DEPTH (FEET) =  0.80  FLOOD WIDTH (FEET) =  5.00
FLOW VELOCITY (FEET/SEC.) =  13.40  DEPTH*VELOCITY (FT*FT/SEC) =  10.72
LONGEST FLOWPATH FROM NODE      14.00 TO NODE      16.00 =  760.00 FEET.
```

```
*****
FLOW PROCESS FROM NODE      16.00 TO NODE      16.00 IS CODE =  13
-----
```

```
>>>>CLEAR THE MAIN-STREAM MEMORY<<<<<
=====
```

BASIN E

```
=====
END OF STUDY SUMMARY:
TOTAL AREA (ACRES)      =      5.94  TC (MIN.) =      6.59
PEAK FLOW RATE (CFS)    =      15.85
=====
END OF RATIONAL METHOD ANALYSIS
```

## BASIN F

\*\*\*\*\*

FLOW PROCESS FROM NODE 17.00 TO NODE 18.00 IS CODE = 21

-----  
>>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<

=====

RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .4100  
SOIL CLASSIFICATION IS "D"  
S.C.S. CURVE NUMBER (AMC II) = 82  
INITIAL SUBAREA FLOW-LENGTH(FEET) = 100.00  
UPSTREAM ELEVATION(FEET) = 336.50  
DOWNSTREAM ELEVATION(FEET) = 325.00  
ELEVATION DIFFERENCE(FEET) = 11.50  
SUBAREA OVERLAND TIME OF FLOW(MIN.) = 5.765  
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 7.090  
SUBAREA RUNOFF(CFS) = 0.29  
TOTAL AREA(ACRES) = 0.10 TOTAL RUNOFF(CFS) = 0.29

\*\*\*\*\*

FLOW PROCESS FROM NODE 18.00 TO NODE 19.00 IS CODE = 91

-----  
>>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<

=====

UPSTREAM NODE ELEVATION(FEET) = 325.00  
DOWNSTREAM NODE ELEVATION(FEET) = 157.50  
CHANNEL LENGTH THRU SUBAREA(FEET) = 605.00  
"V" GUTTER WIDTH(FEET) = 5.00 GUTTER HIKE(FEET) = 0.800  
PAVEMENT LIP(FEET) = 0.400 MANNING'S N = .0300  
PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.02000  
MAXIMUM DEPTH(FEET) = 5.00  
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 6.561  
RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .4100  
SOIL CLASSIFICATION IS "D"  
S.C.S. CURVE NUMBER (AMC II) = 82  
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 10.47  
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 13.70  
AVERAGE FLOW DEPTH(FEET) = 0.80 FLOOD WIDTH(FEET) = 5.00  
"V" GUTTER FLOW TRAVEL TIME(MIN.) = 0.74 Tc(MIN.) = 6.50  
SUBAREA AREA(ACRES) = 7.57 SUBAREA RUNOFF(CFS) = 20.36  
AREA-AVERAGE RUNOFF COEFFICIENT = 0.410  
TOTAL AREA(ACRES) = 7.67 PEAK FLOW RATE(CFS) = 20.63  
END OF SUBAREA "V" GUTTER HYDRAULICS:  
DEPTH(FEET) = 0.80 FLOOD WIDTH(FEET) = 5.00  
FLOW VELOCITY(FEET/SEC.) = 13.70 DEPTH\*VELOCITY(FT\*FT/SEC) = 10.96  
LONGEST FLOWPATH FROM NODE 17.00 TO NODE 19.00 = 705.00 FEET.

## BASIN F

=====

END OF STUDY SUMMARY:

TOTAL AREA(ACRES) = 7.67 TC(MIN.) = 6.50  
PEAK FLOW RATE(CFS) = 20.63

=====

END OF RATIONAL METHOD ANALYSIS

# SITE SUMMARY

\*\*\*\*\*

>>>>BASIN DATA<<<<

BASIN	RUNOFF (CFS)	Tc (MIN.)	AREA (ACRE)
A	22.54	6.66	8.51
B	12.69	8.63	5.66
C	4.23	7.13	1.67
D	19.68	6.80	7.53
E	15.85	6.59	5.94
F	20.63	6.50	7.67
<b>TOTAL:</b>	<b>95.62</b>		<b>36.98</b>

# PRE-DEVELOPMENT DRAINAGE MAP

**A** ③  
 $Q_{100} = 22.54$  CFS  
 $T_c = 6.66$  MIN.  
 $A = 8.51$  AC

**B** ⑥  
 $Q_{100} = 12.69$  CFS  
 $T_c = 8.63$  MIN.  
 $A = 5.66$  AC

$A = 8.41$  AC  
 $L = 700'$

$A = 0.09$  AC  
 $L = 100'$

$A = 0.10$  AC  
 $L = 100'$

$A = 0.11$  AC  
 $L = 100'$   
 360.0

$A = 0.09$  AC  
 $L = 100'$

$A = 0.23$  AC  
 $L = 140'$

$A = 7.42$  AC  
 $L = 810'$

$A = 0.09$  AC  
 $L = 100'$

$A = 1.35$  AC  
 $L = 240'$

$A = 5.57$  AC  
 $L = 900'$

$A = 5.85$  AC  
 $L = 660'$

$A = 0.10$  AC  
 $L = 100'$

$A = 7.57$  AC  
 $L = 605'$

**C**  
 $Q_{100} = 4.23$  CFS  
 $T_c = 7.13$  MIN.  
 $A = 1.67$  AC

**D** ⑬  
 $Q_{100} = 19.68$  CFS  
 $T_c = 6.80$  MIN.  
 $A = 7.53$  AC

**E** ⑯  
 $Q_{100} = 15.85$  CFS  
 $T_c = 6.59$  MIN.  
 $A = 5.94$  AC

**F** ⑰  
 $Q_{100} = 20.63$  CFS  
 $T_c = 6.50$  MIN.  
 $A = 7.67$  AC

## LEGEND:

ITEM

SYMBOL

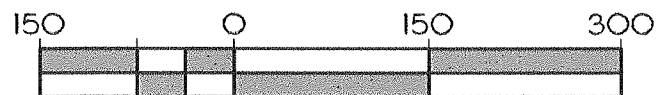
BASIN

NODE

FLOW PATH

⑩①

SCALE 1"=150'



SCALE: 1"=150'



\*\*\*\*\*

RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE  
Reference: SAN DIEGO COUNTY FLOOD CONTROL DISTRICT  
2003,1985,1981 HYDROLOGY MANUAL  
(c) Copyright 1982-2005 Advanced Engineering Software (aes)  
Ver. 2.0 Release Date: 06/01/2005 License ID 1305

Analysis prepared by: CSW

\*\*\*\*\* DESCRIPTION OF STUDY \*\*\*\*\*  
NISSHO RANCH  
POST-DEVELOPMENT HYDROLOGY STUDY  
100-YEAR FREQUENCY  
\*\*\*\*\*

FILE NAME: BO02PO1.DAT  
TIME/DATE OF STUDY: 14:50 06/26/2007

-----  
USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:  
-----

2003 SAN DIEGO MANUAL CRITERIA

USER SPECIFIED STORM EVENT(YEAR) = 100.00  
6-HOUR DURATION PRECIPITATION (INCHES) = 2.950  
SPECIFIED MINIMUM PIPE SIZE(INCH) = 3.00  
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95  
SAN DIEGO HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD  
NOTE: USE MODIFIED RATIONAL METHOD PROCEDURES FOR CONFLUENCE ANALYSIS

\*USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL\*

NO.	HALF- WIDTH (FT)	CROWN TO CROSSFALL (FT)	STREET-CROSSFALL: IN- / OUT- / PARK- SIDE / SIDE / WAY	CURB HEIGHT (FT)	GUTTER-GEOMETRIES: WIDTH (FT)	LIP (FT)	HIKE (FT)	MANNING FACTOR (n)
1	30.0	20.0	0.018/0.018/0.020	0.67	2.00	0.0313	0.167	0.0150

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

1. Relative Flow-Depth = 0.00 FEET  
as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
2. (Depth)\*(Velocity) Constraint = 6.0 (FT\*FT/S)

\*SIZE PIPE WITH A FLOW CAPACITY GREATER THAN  
OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.\*

## BASIN A

\*\*\*\*\*  
FLOW PROCESS FROM NODE 1.00 TO NODE 2.00 IS CODE = 21  
-----

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<

=====

RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT =	.4100
SOIL CLASSIFICATION IS "D"	
S.C.S. CURVE NUMBER (AMC II) =	82
INITIAL SUBAREA FLOW-LENGTH(FEET) =	100.00
UPSTREAM ELEVATION(FEET) =	380.50
DOWNSTREAM ELEVATION(FEET) =	375.00
ELEVATION DIFFERENCE(FEET) =	5.50
SUBAREA OVERLAND TIME OF FLOW(MIN.) =	7.037
100 YEAR RAINFALL INTENSITY(INCH/HOUR) =	6.235
SUBAREA RUNOFF(CFS) =	0.26
TOTAL AREA(ACRES) =	0.10
TOTAL RUNOFF(CFS) =	0.26

\*\*\*\*\*  
FLOW PROCESS FROM NODE 2.00 TO NODE 3.00 IS CODE = 61  
-----

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<

>>>>(STANDARD CURB SECTION USED)<<<<<

=====

UPSTREAM ELEVATION(FEET) =	375.00	DOWNSTREAM ELEVATION(FEET) =	342.00
STREET LENGTH(FEET) =	460.00	CURB HEIGHT(INCHES) =	6.0
STREET HALFWIDTH(FEET) =	12.00		

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 2.00

INSIDE STREET CROSSFALL(DECIMAL) = 0.020

OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 1

STREET PARKWAY CROSSFALL(DECIMAL) = 0.020

Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) = 0.0150

Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200

\*\*TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 2.44

STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:

STREET FLOW DEPTH(FEET) = 0.25

HALFSTREET FLOOD WIDTH(FEET) = 6.25

AVERAGE FLOW VELOCITY(FEET/SEC.) = 4.79

PRODUCT OF DEPTH&VELOCITY(FT\*FT/SEC.) = 1.20

STREET FLOW TRAVEL TIME(MIN.) = 1.60 Tc(MIN.) = 8.64

100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 5.464

RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .4100

SOIL CLASSIFICATION IS "D"

S.C.S. CURVE NUMBER (AMC II) = 82

AREA-AVERAGE RUNOFF COEFFICIENT = 0.410

SUBAREA AREA(ACRES) = 1.94 SUBAREA RUNOFF(CFS) = 4.35

TOTAL AREA(ACRES) = 2.04 PEAK FLOW RATE(CFS) = 4.57

END OF SUBAREA STREET FLOW HYDRAULICS:

DEPTH(FEET) = 0.30 HALFSTREET FLOOD WIDTH(FEET) = 8.44

FLOW VELOCITY(FEET/SEC.) = 5.50 DEPTH\*VELOCITY(FT\*FT/SEC.) = 1.62

LONGEST FLOWPATH FROM NODE 1.00 TO NODE 3.00 = 560.00 FEET.



```

*****
FLOW PROCESS FROM NODE      3.00 TO NODE      4.00 IS CODE =   91
-----
>>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
=====
UPSTREAM NODE ELEVATION(FEET) =      342.00
DOWNSTREAM NODE ELEVATION(FEET) =      258.00
CHANNEL LENGTH THRU SUBAREA(FEET) =      670.00
"V" GUTTER WIDTH(FEET) =      5.00  GUTTER HIKE(FEET) =      0.800
PAVEMENT LIP(FEET) =      0.400  MANNING'S N = .0300
PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.02000
MAXIMUM DEPTH(FEET) =      1.50
  100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 5.020
RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .4100
SOIL CLASSIFICATION IS "D"
S.C.S. CURVE NUMBER (AMC II) = 82
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      7.46
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) =      9.22
AVERAGE FLOW DEPTH(FEET) =      0.80  FLOOD WIDTH(FEET) =      5.00
"V" GUTTER FLOW TRAVEL TIME(MIN.) =      1.21  Tc(MIN.) =      9.85
SUBAREA AREA(ACRES) =      2.81  SUBAREA RUNOFF(CFS) =      5.78
AREA-AVERAGE RUNOFF COEFFICIENT = 0.410
TOTAL AREA(ACRES) =      4.85  PEAK FLOW RATE(CFS) =      9.98
END OF SUBAREA "V" GUTTER HYDRAULICS:
DEPTH(FEET) = 0.80  FLOOD WIDTH(FEET) =      5.00
FLOW VELOCITY(FEET/SEC.) =      9.22  DEPTH*VELOCITY(FT*FT/SEC) =      7.37
LONGEST FLOWPATH FROM NODE      1.00 TO NODE      4.00 = 1230.00 FEET.

```

```

*****
FLOW PROCESS FROM NODE      4.00 TO NODE      4.00 IS CODE =    1
-----
>>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
=====
TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION(MIN.) =      9.85
RAINFALL INTENSITY(INCH/HR) =      5.02
TOTAL STREAM AREA(ACRES) =      4.85
PEAK FLOW RATE(CFS) AT CONFLUENCE =      9.98

```

```

*****
FLOW PROCESS FROM NODE      5.00 TO NODE      6.00 IS CODE =   21
-----
>>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
=====
RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .4100
SOIL CLASSIFICATION IS "D"
S.C.S. CURVE NUMBER (AMC II) = 82
INITIAL SUBAREA FLOW-LENGTH(FEET) =      100.00
UPSTREAM ELEVATION(FEET) =      375.00
DOWNSTREAM ELEVATION(FEET) =      365.00
ELEVATION DIFFERENCE(FEET) =      10.00
SUBAREA OVERLAND TIME OF FLOW(MIN.) =      5.765
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 7.090
SUBAREA RUNOFF(CFS) =      0.23
TOTAL AREA(ACRES) =      0.08  TOTAL RUNOFF(CFS) =      0.23

```

\*\*\*\*\*

FLOW PROCESS FROM NODE 6.00 TO NODE 7.00 IS CODE = 61

>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<

>>>>(STANDARD CURB SECTION USED)<<<<

=====

UPSTREAM ELEVATION( FEET ) = 365.00 DOWNSTREAM ELEVATION( FEET ) = 345.00

STREET LENGTH( FEET ) = 260.00 CURB HEIGHT( INCHES ) = 6.0

STREET HALFWIDTH( FEET ) = 12.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK( FEET ) = 2.00

INSIDE STREET CROSSFALL( DECIMAL ) = 0.020

OUTSIDE STREET CROSSFALL( DECIMAL ) = 0.020

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 1

STREET PARKWAY CROSSFALL( DECIMAL ) = 0.020

Manning's FRICTION FACTOR for Streetflow Section( curb-to-curb ) = 0.0150

Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200

\*\*TRAVEL TIME COMPUTED USING ESTIMATED FLOW( CFS ) = 0.34

STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:

STREET FLOW DEPTH( FEET ) = 0.16

HALFSTREET FLOOD WIDTH( FEET ) = 1.50

AVERAGE FLOW VELOCITY( FEET/SEC. ) = 5.23

PRODUCT OF DEPTH&VELOCITY( FT\*FT/SEC. ) = 0.82

STREET FLOW TRAVEL TIME( MIN. ) = 0.83 Tc( MIN. ) = 6.59

100 YEAR RAINFALL INTENSITY( INCH/HOUR ) = 6.502

RESIDENTIAL ( 1. DU/AC OR LESS ) RUNOFF COEFFICIENT = .4100

SOIL CLASSIFICATION IS "D"

S.C.S. CURVE NUMBER ( AMC II ) = 82

AREA-AVERAGE RUNOFF COEFFICIENT = 0.410

SUBAREA AREA( ACRES ) = 0.08 SUBAREA RUNOFF( CFS ) = 0.21

TOTAL AREA( ACRES ) = 0.16 PEAK FLOW RATE( CFS ) = 0.43

END OF SUBAREA STREET FLOW HYDRAULICS:

DEPTH( FEET ) = 0.16 HALFSTREET FLOOD WIDTH( FEET ) = 1.50

FLOW VELOCITY( FEET/SEC. ) = 5.23 DEPTH\*VELOCITY( FT\*FT/SEC. ) = 0.82

LONGEST FLOWPATH FROM NODE 5.00 TO NODE 7.00 = 360.00 FEET.

\*\*\*\*\*

FLOW PROCESS FROM NODE 7.00 TO NODE 4.00 IS CODE = 91

-----  
>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<

=====

UPSTREAM NODE ELEVATION(FEET) = 345.00  
DOWNSTREAM NODE ELEVATION(FEET) = 258.00  
CHANNEL LENGTH THRU SUBAREA(FEET) = 515.00  
"V" GUTTER WIDTH(FEET) = 2.00 GUTTER HIKE(FEET) = 0.800  
PAVEMENT LIP(FEET) = 0.400 MANNING'S N = .0300  
PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.02000  
MAXIMUM DEPTH(FEET) = 1.50  
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 5.979  
RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .4100  
SOIL CLASSIFICATION IS "D"  
S.C.S. CURVE NUMBER (AMC II) = 82  
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 5.00  
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 9.37  
AVERAGE FLOW DEPTH(FEET) = 0.80 FLOOD WIDTH(FEET) = 2.00  
"V" GUTTER FLOW TRAVEL TIME(MIN.) = 0.92 Tc(MIN.) = 7.51  
SUBAREA AREA(ACRES) = 3.73 SUBAREA RUNOFF(CFS) = 9.14  
AREA-AVERAGE RUNOFF COEFFICIENT = 0.410  
TOTAL AREA(ACRES) = 3.89 PEAK FLOW RATE(CFS) = 9.54  
END OF SUBAREA "V" GUTTER HYDRAULICS:  
DEPTH(FEET) = 1.20 FLOOD WIDTH(FEET) = 2.00  
FLOW VELOCITY(FEET/SEC.) = 12.41 DEPTH\*VELOCITY(FT\*FT/SEC) = 14.89  
LONGEST FLOWPATH FROM NODE 5.00 TO NODE 4.00 = 875.00 FEET.

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 4.00 TO NODE 4.00 IS CODE = 1  
 -----

>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<  
 >>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<  
 =====

TOTAL NUMBER OF STREAMS = 2  
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 2 ARE:  
 TIME OF CONCENTRATION (MIN.) = 7.51  
 RAINFALL INTENSITY (INCH/HR) = 5.98  
 TOTAL STREAM AREA (ACRES) = 3.89  
 PEAK FLOW RATE (CFS) AT CONFLUENCE = 9.54

\*\* CONFLUENCE DATA \*\*

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)	AREA (ACRE)
1	9.98	9.85	5.020	4.85
2	9.54	7.51	5.979	3.89

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO  
 CONFLUENCE FORMULA USED FOR 2 STREAMS.

\*\* PEAK FLOW RATE TABLE \*\*

STREAM NUMBER	RUNOFF (CFS)	Tc (MIN.)	INTENSITY (INCH/HOUR)
1	17.15	7.51	5.979
2	17.99	9.85	5.020

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:  
 PEAK FLOW RATE (CFS) = 17.99 Tc (MIN.) = 9.85  
 TOTAL AREA (ACRES) = 8.74  
 LONGEST FLOWPATH FROM NODE 1.00 TO NODE 4.00 = 1230.00 FEET.

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 4.00 TO NODE 4.00 IS CODE = 13  
 -----

>>>>CLEAR THE MAIN-STREAM MEMORY<<<<  
 =====

BASIN A

=====

END OF STUDY SUMMARY:

TOTAL AREA (ACRES) = 8.74 TC (MIN.) = 9.85  
 PEAK FLOW RATE (CFS) = 17.99

=====

END OF RATIONAL METHOD ANALYSIS

# BASIN B

\*\*\*\*\*

FLOW PROCESS FROM NODE 8.00 TO NODE 9.00 IS CODE = 21

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<

RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .4100  
 SOIL CLASSIFICATION IS "D"  
 S.C.S. CURVE NUMBER (AMC II) = 82  
 INITIAL SUBAREA FLOW-LENGTH(FEET) = 100.00  
 UPSTREAM ELEVATION(FEET) = 375.00  
 DOWNSTREAM ELEVATION(FEET) = 365.00  
 ELEVATION DIFFERENCE(FEET) = 10.00  
 SUBAREA OVERLAND TIME OF FLOW(MIN.) = 5.765  
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 7.090  
 SUBAREA RUNOFF(CFS) = 0.29  
 TOTAL AREA(ACRES) = 0.11 TOTAL RUNOFF(CFS) = 0.29

\*\*\*\*\*

FLOW PROCESS FROM NODE 9.00 TO NODE 10.00 IS CODE = 91

>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<

UPSTREAM NODE ELEVATION(FEET) = 365.00  
 DOWNSTREAM NODE ELEVATION(FEET) = 235.00  
 CHANNEL LENGTH THRU SUBAREA(FEET) = 785.00  
 "V" GUTTER WIDTH(FEET) = 5.00 GUTTER HIKE(FEET) = 0.800  
 PAVEMENT LIP(FEET) = 0.400 MANNING'S N = .0300  
 PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.02000  
 MAXIMUM DEPTH(FEET) = 1.50  
 100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 6.256  
 RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .4100  
 SOIL CLASSIFICATION IS "D"  
 S.C.S. CURVE NUMBER (AMC II) = 82  
 TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 7.24  
 TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 10.59  
 AVERAGE FLOW DEPTH(FEET) = 0.80 FLOOD WIDTH(FEET) = 5.00  
 "V" GUTTER FLOW TRAVEL TIME(MIN.) = 1.24 Tc(MIN.) = 7.00  
 SUBAREA AREA(ACRES) = 5.30 SUBAREA RUNOFF(CFS) = 13.90  
 AREA-AVERAGE RUNOFF COEFFICIENT = 0.410  
 TOTAL AREA(ACRES) = 5.41 PEAK FLOW RATE(CFS) = 14.16  
 END OF SUBAREA "V" GUTTER HYDRAULICS:  
 DEPTH(FEET) = 0.80 FLOOD WIDTH(FEET) = 5.00  
 FLOW VELOCITY(FEET/SEC.) = 10.59 DEPTH\*VELOCITY(FT\*FT/SEC) = 8.47  
 LONGEST FLOWPATH FROM NODE 8.00 TO NODE 10.00 = 885.00 FEET.

\*\*\*\*\*

FLOW PROCESS FROM NODE 10.00 TO NODE 10.00 IS CODE = 13

>>>>CLEAR THE MAIN-STREAM MEMORY<<<<<

=====

BASIN B

=====

END OF STUDY SUMMARY:

TOTAL AREA (ACRES) = 5.41 TC (MIN.) = 7.00

PEAK FLOW RATE (CFS) = 14.16

=====

END OF RATIONAL METHOD ANALYSIS

# BASIN C

```
*****
FLOW PROCESS FROM NODE      11.00 TO NODE      12.00 IS CODE =  21
-----
```

```
>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
```

```
=====
RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .4100
SOIL CLASSIFICATION IS "D"
S.C.S. CURVE NUMBER (AMC II) = 82
INITIAL SUBAREA FLOW-LENGTH(FEET) = 100.00
UPSTREAM ELEVATION(FEET) = 380.50
DOWNSTREAM ELEVATION(FEET) = 365.00
ELEVATION DIFFERENCE(FEET) = 15.50
SUBAREA OVERLAND TIME OF FLOW(MIN.) = 5.765
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 7.090
SUBAREA RUNOFF(CFS) = 0.32
TOTAL AREA(ACRES) = 0.11 TOTAL RUNOFF(CFS) = 0.32
```

```
*****
FLOW PROCESS FROM NODE      12.00 TO NODE      13.00 IS CODE =  61
-----
```

```
>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
```

```
>>>>(STANDARD CURB SECTION USED)<<<<<
```

```
=====
UPSTREAM ELEVATION(FEET) = 365.00 DOWNSTREAM ELEVATION(FEET) = 310.00
STREET LENGTH(FEET) = 395.00 CURB HEIGHT(INCHES) = 6.0
STREET HALFWIDTH(FEET) = 12.00
```

```
DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) = 2.00
```

```
INSIDE STREET CROSSFALL(DECIMAL) = 0.020
```

```
OUTSIDE STREET CROSSFALL(DECIMAL) = 0.020
```

```
SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF = 2
```

```
STREET PARKWAY CROSSFALL(DECIMAL) = 0.020
```

```
Manning's FRICTION FACTOR for Streetflow Section(curbs-to-curbs) = 0.0150
```

```
Manning's FRICTION FACTOR for Back-of-Walk Flow Section = 0.0200
```

```
**TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 2.37
```

```
STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
```

```
STREET FLOW DEPTH(FEET) = 0.18
```

```
HALFSTREET FLOOD WIDTH(FEET) = 2.86
```

```
AVERAGE FLOW VELOCITY(FT/SEC.) = 5.93
```

```
PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) = 1.09
```

```
STREET FLOW TRAVEL TIME(MIN.) = 1.11 Tc(MIN.) = 6.88
```

```
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 6.329
```

```
RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .4100
```

```
SOIL CLASSIFICATION IS "D"
```

```
S.C.S. CURVE NUMBER (AMC II) = 82
```

```
AREA-AVERAGE RUNOFF COEFFICIENT = 0.410
```

```
SUBAREA AREA(ACRES) = 1.58 SUBAREA RUNOFF(CFS) = 4.10
```

```
TOTAL AREA(ACRES) = 1.69 PEAK FLOW RATE(CFS) = 4.39
```

```
END OF SUBAREA STREET FLOW HYDRAULICS:
```

```
DEPTH(FEET) = 0.22 HALFSTREET FLOOD WIDTH(FEET) = 4.85
```

```
FLOW VELOCITY(FT/SEC.) = 6.20 DEPTH*VELOCITY(FT*FT/SEC.) = 1.38
```

```
LONGEST FLOWPATH FROM NODE 11.00 TO NODE 13.00 = 495.00 FEET.
```

```
*****
FLOW PROCESS FROM NODE      13.00 TO NODE      13.00 IS CODE =  13
-----
>>>>>CLEAR THE MAIN-STREAM MEMORY<<<<<
=====
```

# BASIN C

```
=====
END OF STUDY SUMMARY:
TOTAL AREA (ACRES)      =      1.69  TC (MIN.) =      6.88
PEAK FLOW RATE (CFS)    =      4.39
=====
END OF RATIONAL METHOD ANALYSIS
```



# BASIN D

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 14.00 TO NODE 15.00 IS CODE = 21  
 -----

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<

=====

```

RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .4100
SOIL CLASSIFICATION IS "D"
S.C.S. CURVE NUMBER (AMC II) = 82
INITIAL SUBAREA FLOW-LENGTH(FEET) = 100.00
UPSTREAM ELEVATION(FEET) = 375.00
DOWNSTREAM ELEVATION(FEET) = 360.00
ELEVATION DIFFERENCE(FEET) = 15.00
SUBAREA OVERLAND TIME OF FLOW(MIN.) = 5.765
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 7.090
SUBAREA RUNOFF(CFS) = 0.41
TOTAL AREA(ACRES) = 0.14 TOTAL RUNOFF(CFS) = 0.41
  
```

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 15.00 TO NODE 16.00 IS CODE = 91  
 -----

>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<

=====

```

UPSTREAM NODE ELEVATION(FEET) = 360.00
DOWNSTREAM NODE ELEVATION(FEET) = 156.50
CHANNEL LENGTH THRU SUBAREA(FEET) = 810.00
"V" GUTTER WIDTH(FEET) = 5.00 GUTTER HIKE(FEET) = 0.800
PAVEMENT LIP(FEET) = 0.400 MANNING'S N = .0300
PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.02000
MAXIMUM DEPTH(FEET) = 2.00
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 6.374
RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .4100
SOIL CLASSIFICATION IS "D"
S.C.S. CURVE NUMBER (AMC II) = 82
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 9.84
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 13.05
AVERAGE FLOW DEPTH(FEET) = 0.80 FLOOD WIDTH(FEET) = 5.00
"V" GUTTER FLOW TRAVEL TIME(MIN.) = 1.03 Tc(MIN.) = 6.80
SUBAREA AREA(ACRES) = 7.22 SUBAREA RUNOFF(CFS) = 18.87
AREA-AVERAGE RUNOFF COEFFICIENT = 0.410
TOTAL AREA(ACRES) = 7.36 PEAK FLOW RATE(CFS) = 19.23
END OF SUBAREA "V" GUTTER HYDRAULICS:
DEPTH(FEET) = 0.80 FLOOD WIDTH(FEET) = 5.00
FLOW VELOCITY(FEET/SEC.) = 13.05 DEPTH*VELOCITY(FT*FT/SEC) = 10.44
LONGEST FLOWPATH FROM NODE 14.00 TO NODE 16.00 = 910.00 FEET.
  
```

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 16.00 TO NODE 16.00 IS CODE = 13  
 -----

>>>>CLEAR THE MAIN-STREAM MEMORY<<<<<

=====

BASIN D

```
=====
END OF STUDY SUMMARY:
TOTAL AREA (ACRES)      =      7.36  TC (MIN.) =      6.80
PEAK FLOW RATE (CFS)    =      19.23
=====
END OF RATIONAL METHOD ANALYSIS
```

# BASIN E

```
*****
FLOW PROCESS FROM NODE      17.00 TO NODE      18.00 IS CODE = 21
-----
```

```
>>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
=====
```

```
RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .4100
SOIL CLASSIFICATION IS "D"
S.C.S. CURVE NUMBER (AMC II) = 82
INITIAL SUBAREA FLOW-LENGTH(FEET) = 100.00
UPSTREAM ELEVATION(FEET) = 350.00
DOWNSTREAM ELEVATION(FEET) = 324.00
ELEVATION DIFFERENCE(FEET) = 26.00
SUBAREA OVERLAND TIME OF FLOW(MIN.) = 5.765
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 7.090
SUBAREA RUNOFF(CFS) = 0.32
TOTAL AREA(ACRES) = 0.11 TOTAL RUNOFF(CFS) = 0.32
```

```
*****
FLOW PROCESS FROM NODE      18.00 TO NODE      19.00 IS CODE = 91
-----
```

```
>>>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<<
=====
```

```
UPSTREAM NODE ELEVATION(FEET) = 324.00
DOWNSTREAM NODE ELEVATION(FEET) = 156.00
CHANNEL LENGTH THRU SUBAREA(FEET) = 685.00
"V" GUTTER WIDTH(FEET) = 5.00 GUTTER HIKE(FEET) = 0.800
PAVEMENT LIP(FEET) = 0.400 MANNING'S N = .0300
PAVEMENT CROSSFALL(DECIMAL NOTATION) = 0.02000
MAXIMUM DEPTH(FEET) = 1.50
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 6.466
RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT = .4100
SOIL CLASSIFICATION IS "D"
S.C.S. CURVE NUMBER (AMC II) = 82
TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) = 8.27
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY(FEET/SEC.) = 12.89
AVERAGE FLOW DEPTH(FEET) = 0.80 FLOOD WIDTH(FEET) = 5.00
"V" GUTTER FLOW TRAVEL TIME(MIN.) = 0.89 Tc(MIN.) = 6.65
SUBAREA AREA(ACRES) = 6.00 SUBAREA RUNOFF(CFS) = 15.91
AREA-AVERAGE RUNOFF COEFFICIENT = 0.410
TOTAL AREA(ACRES) = 6.11 PEAK FLOW RATE(CFS) = 16.20
END OF SUBAREA "V" GUTTER HYDRAULICS:
DEPTH(FEET) = 0.80 FLOOD WIDTH(FEET) = 5.00
FLOW VELOCITY(FEET/SEC.) = 12.89 DEPTH*VELOCITY(FT*FT/SEC) = 10.31
LONGEST FLOWPATH FROM NODE 17.00 TO NODE 19.00 = 785.00 FEET.
```

```
*****
FLOW PROCESS FROM NODE      19.00 TO NODE      19.00 IS CODE = 13
-----
```

```
>>>>>CLEAR THE MAIN-STREAM MEMORY<<<<<
=====
```

BASIN E

=====

END OF STUDY SUMMARY:			
TOTAL AREA (ACRES)	=	6.11	TC (MIN.) = 6.65
PEAK FLOW RATE (CFS)	=	16.20	

=====

=====

END OF RATIONAL METHOD ANALYSIS

# BASIN F

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 20.00 TO NODE 21.00 IS CODE = 21

-----  
 >>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

=====

RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT =	.4100
SOIL CLASSIFICATION IS "D"	
S.C.S. CURVE NUMBER (AMC II) =	82
INITIAL SUBAREA FLOW-LENGTH (FEET) =	100.00
UPSTREAM ELEVATION (FEET) =	336.50
DOWNSTREAM ELEVATION (FEET) =	325.00
ELEVATION DIFFERENCE (FEET) =	11.50
SUBAREA OVERLAND TIME OF FLOW (MIN.) =	5.765
100 YEAR RAINFALL INTENSITY (INCH/HOUR) =	7.090
SUBAREA RUNOFF (CFS) =	0.29
TOTAL AREA (ACRES) =	0.10
TOTAL RUNOFF (CFS) =	0.29

\*\*\*\*\*  
 FLOW PROCESS FROM NODE 21.00 TO NODE 22.00 IS CODE = 91

-----  
 >>>>COMPUTE "V" GUTTER FLOW TRAVEL TIME THRU SUBAREA<<<<

=====

UPSTREAM NODE ELEVATION (FEET) =	325.00
DOWNSTREAM NODE ELEVATION (FEET) =	157.50
CHANNEL LENGTH THRU SUBAREA (FEET) =	605.00
"V" GUTTER WIDTH (FEET) =	5.00
GUTTER HIKE (FEET) =	0.800
PAVEMENT LIP (FEET) =	0.400
MANNING'S N =	.0300
PAVEMENT CROSSFALL (DECIMAL NOTATION) =	0.02000
MAXIMUM DEPTH (FEET) =	2.00
100 YEAR RAINFALL INTENSITY (INCH/HOUR) =	6.561
RESIDENTIAL (1. DU/AC OR LESS) RUNOFF COEFFICIENT =	.4100
SOIL CLASSIFICATION IS "D"	
S.C.S. CURVE NUMBER (AMC II) =	82
TRAVEL TIME COMPUTED USING ESTIMATED FLOW (CFS) =	10.47
TRAVEL TIME THRU SUBAREA BASED ON VELOCITY (FEET/SEC.) =	13.70
AVERAGE FLOW DEPTH (FEET) =	0.80
FLOOD WIDTH (FEET) =	5.00
"V" GUTTER FLOW TRAVEL TIME (MIN.) =	0.74
Tc (MIN.) =	6.50
SUBAREA AREA (ACRES) =	7.57
SUBAREA RUNOFF (CFS) =	20.36
AREA-AVERAGE RUNOFF COEFFICIENT =	0.410
TOTAL AREA (ACRES) =	7.67
PEAK FLOW RATE (CFS) =	20.63
END OF SUBAREA "V" GUTTER HYDRAULICS:	
DEPTH (FEET) =	0.80
FLOOD WIDTH (FEET) =	5.00
FLOW VELOCITY (FEET/SEC.) =	13.70
DEPTH*VELOCITY (FT*FT/SEC) =	10.96
LONGEST FLOWPATH FROM NODE 20.00 TO NODE 22.00 =	705.00 FEET.

# BASIN F

=====

END OF STUDY SUMMARY:

TOTAL AREA (ACRES)	=	7.67	TC (MIN.) =	6.50
PEAK FLOW RATE (CFS)	=	20.63		

=====

END OF RATIONAL METHOD ANALYSIS

# SITE SUMMARY

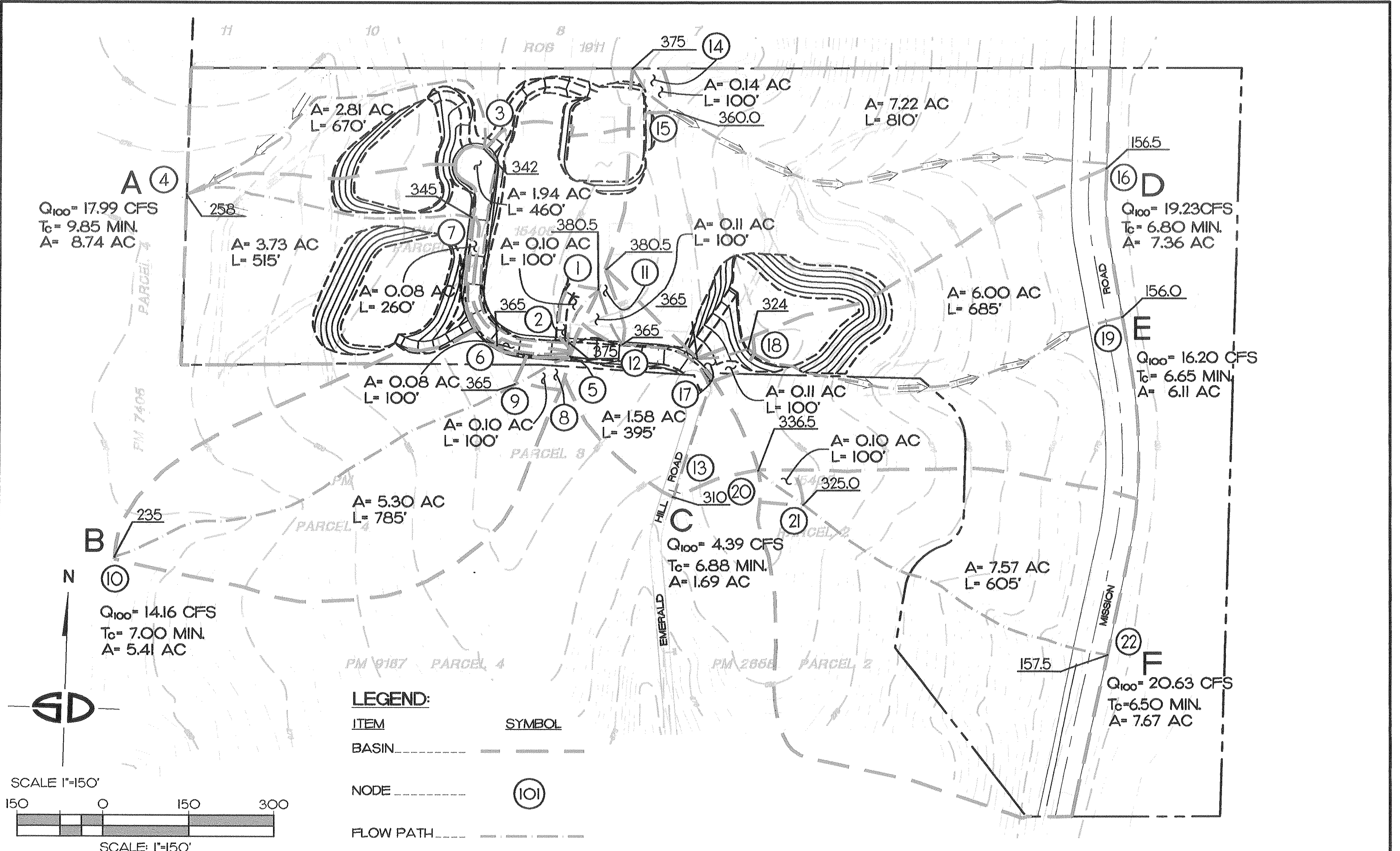
\*\*\*\*\*

## >>>>BASIN DATA<<<<

BASIN	RUNOFF (CFS)	Tc (MIN.)	AREA (ACRE)
A	17.99	9.85	8.74
B	14.16	7.00	5.41
C	4.39	6.88	1.69
D	19.23	6.80	7.36
E	16.20	6.65	6.11
F	20.63	6.50	7.67

TOTAL:	92.60		36.98
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# POST-DEVELOPMENT DRAINAGE MAP



# **Snipes-Dye associates**

G. Howard Dye, L.S.  
Principal

Robert L. Bruckart, P.E.  
Principal

William A. Snipes, P.E.  
Principal

William R. Dick, P.E.  
Principal

April 19, 2010

File: BO0281

COUNTY OF SAN DIEGO  
Department of Public Works  
5201 Ruffin Road  
San Diego, CA 92123

Re: TPM21057-Nissho Ranch Drainage Study Supplemental Letter

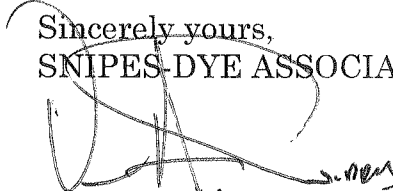
Dear Mr. Sinsay:

The hydrology/drainage study dated July 3, 2007 for the above-mentioned project has been approved by the County of San Diego on January 18, 2008. The approval was for a project that included a portion of Mission Road and property on both sides of the road. Caltrans has taken right-of-way on both sides of the project thus reducing the project area. The project has also been modified to add a secondary fire access road.

With the proposed change to the project there will not be an increase in runoff from the previously approved project hydrology/drainage study calculations.

If you have any questions please contact me.

Sincerely yours,  
SNIPES-DYE ASSOCIATES

  
William A. Snipes, P.E., L.S.  
Principal



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